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2124

3

DATE MAILED: 09/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-----------------|-------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 09/604,113 | SZEWERENKO ET AL. | |
| | Examiner | Art Unit | |
| | Tuan A Vu | 2124 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 26 June 2000.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-9 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 11 September 2000 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

| | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This action is responsive to the application filed June 26, 2000.

Claims 1-9 have been submitted for examination.

Formal drawings received and filed 09/11/2000 are also considered.

Claim Objections

2. Claims 2, 4, 7 and 8 are objected to for informalities as follows.

Claim 2 is objected to because of the following informalities: there appears to be a misprint in that the recited element “method of Claim 2” should be – method of claim 1 – for the instant claim cannot depend on itself.

Also in claim 2, there is need to modify the syntactic structure of the claim. After “resources are a problem”, the rest of the sentence can be modified, for example, to read -- , a step of using a sequence of trampolines is further included – so as to make it more grammatically readable.

Claim 4 is objected to because it appears to be a missing term after “C and T”(line 1, pg.

- 31). The term to be inserted, e.g. – are --, would make the limitation read “if C and T are allocated close enough to each other ...”.

Claim 7 is also objected to because some missing term is needed in the sentence “if too far distant determining if there already is ...”(pg. 32, line 9). The suggested corrected sentence can be, for example, -- if it is too far distant then determining if ...”. Further, some missing term appears to be in the sentence “ ... and if not already a trampoline to the target generating ...”(pg. 32, line 12). The suggested correction would be “ ... and if there is not already a trampoline to the target then generating ...” to make it more grammatically readable.

Claim 8 is also rejected to because of incongruous syntactic construct as in "...where if a single-trampoline fails to work because of resources the step of generating a second ..." (pg. 32, lines 16-17). The proposed correction would be for example – wherein if a single trampoline fails to work because of resources, then included are the steps of: generating a second trampoline and generating ...-- to make it more grammatically readable.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites the limitation "B1 in S1" (pg. 31, line 7), "T?" (pg. 31, line 12) and "B2" (pg. 31, lines 16, 19, 20) without defining what those numerals stand for. There is insufficient antecedent basis for this limitation in the claim.

Based on the specifications, Examiner will interpret "B1", "T?" and "B2" as if they were respectively 'call B1', 'target T', and 'call B2' to proceed on with the examination of the claim merits. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gheith, USPN: 5,797,014 (hereinafter Gheith), in view of Long et al., USPN: 5,835,958 (hereinafter Long).

As per claim 1, Gheith discloses a method of fixing link time problems relating to out-of-range limitations in transfer of control, comprising: determining if a transfer of control is beyond a near call limitation (e.g. *pointer that may ... cross a module boundary ... external function call* -- col. 4, line 40 to col. 5, line 50) and if so, generating a long distance transfer of control by redirecting original call to a code (e.g. *set pointer to function address → save GOT → call new GOT → branch* -- Fig. 1; *foo-glue* -- col. 5, line 63 to col. 6, line 10) which will transfer control to the original target.

But Gheith does not specify generating a trampoline code when a transfer of control is determined to be beyond a near call instruction. But Gheith discloses use of global offset table including function call arguments and context switching and target address pointer information as shown in rejection above (e.g. col. 4, line 40 to col. 5, line 50) as well as some glue code to provide the glueing to external callee function and the returning to the calling function (e.g. col. 5, line 63 to col. 6, line 10). Further, this technique of executing discontiguous sections of memory via some trampoline or context switching code is evidenced by Long who, in a method to set up long jump calls and return therefrom to non-contiguous calls in a run-time memory, uses trampoline with prologue and epilogue code (e.g. col. 7, line 47 to col. 8, line 36; Fig. 4). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide prologue and epilogue code to implement a trampoline scheme as taught by Long, to

enhance the external call function replacement scheme because as suggested by Long, the trampoline would alleviate additional re-allocation of run-time memory by presetting all the context switching parameters in the epilog or prologue functions in a same function.

As per claim 2, based on the teachings of Long, as long as memory requirements such as stack-based allocation become a limitation, Long uses trampoline code to effect the long jumps (e.g. Fig. 2-4) between separated portions of memory. Based on the rationale used in claim 1 in combining Long's trampoline scheme code to enhance Gheith's method to replace non-local calls, this limitation of using a sequence of trampolines would have been also obvious, the motivation being that the more run-time re-allocation is required to effect remotely addressable instructions, the more the need to establish prologue and epilogue code, i.e. sequence of trampolines, would justify according to the rationale mentioned above.

As per claim 3, Gheith discloses making far calls comprising providing link time (e.g. col. 4, lines 40-49) modification of object code generated by the compiler by the addition of a custom generated object code to the link without changing the compiler instructions or expanding object code (re claim 1; *foo-glue* -- col. 5, line 63 to col. 6, line 10 – Note: Glue code inserted at link time does not expand any further the object code with additional run-time allocation).

7. Claims 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gheith, USPN: 5,797,014 and Long et al., USPN: 5,835,958, further in view of Kurahashi, USPN: 5,740,447 (hereinafter Kurahashi).

As per claim 4, Gheith discloses method of call instructions comprising: generating near-call instructions for all external calls, near-return for all global returns, the linker allocating all

object code sections without need to take into account the limitations of the near-branch instructions (e.g. *set pointer to function address* → *save GOT* → *call new GOT* → *branch* -- Fig. 1; col. 5, line 63 to col. 6, line 10 – Note: systematic use of pointer setup and GOT to set up arguments and address pointing for external branching implicitly discloses dynamic re-layout of memory at link time and analysis of near-call limitations).

But Gheith does not specify that for each external call C, computing the distance from C to its target T and if C and T are close enough to each other, then applying C calling T without consideration even though Gheith (e.g. Fig. 1) implicitly teaches checking some distance and set up pointer function to effect the branch without modification. Nor does Gheith disclose that if C and T are not close enough while there is a trampoline allowing a near call from C to T, then modifying C to point to call B1 in trampoline S1 and returning to consider the next call. Kurahashi, in a method to optimize code length by performing branch instructions using address relocation analogous to Gheith's use of redirection via GOT to address external branch, discloses distance calculating between the branch instruction and established next target address information (e.g. Fig. 1, 3) With the analysis of effecting the glue code by Gheith for external call (see claim 1) and the selectively setting of trampoline code as taught by Long (see claim 1), it would have been obvious for one of ordinary skill in the art at the time the invention was made to add the distance computing as suggested by Kurahashi to Gheith and Long's combined method so to first, call T by C whenever C and T are close enough to each other; and second, set up a pointing to a subroutine within a trampoline code (point to B1 of S1) to effect a near call when C and T are far enough in the memory call sequence (via the context switching code and settings as suggested by Gheith and further enhanced by Long). The motivation would be

obvious because calculating the relocation resources is indispensable in optimization method and based on such distance computing as taught by Kurahashi the effect of using trampoline and alleviating of run-time resources would be much more enhanced the same rationale and benefits as mentioned above in claim 1; and also to alleviate long call when a near call is available.

Nor does Gheith disclose modifying the object code for creating trampoline S1 and point B1 in S1 until reaching target T before returning to consider the next call, but this limitation would have been obvious in view of the rationale just mentioned above using Kurahashi, Gheith and Long's teachings.

Nor does Gheith disclose if a second trampoline S2 exists then modifying an existing call B2 in S2 and assigning B2 in S2 to contain a far call to T; or else creating trampoline S2 and point B2 therein to effect a far call to T from modifying S1 and effecting a near call via B2 in S2 to reach T as claimed. This limitation would have been obvious in light of the teachings by Long to provide prologue and epilogue code to start the near side of the memory and to hook the far side of the memory back into the calling code (e.g Fig. 4), such codes being equivalent to effecting a far call from the proximal end of the memory and via which, making a near call at the distant end of the memory, i.e. making B1 to call B2 in created S2 to effect a call to T seen as 2 near-calls. This motivation to combine Long's teachings with Gheith (enhanced with Kurahashi's teachings) to transform all long/external call into local/short calls as intended by Gheith would have been obvious for the reasons as to alleviate run-time resources or the same rationale and benefits as mentioned above in claim 1.

As per claim 5, Gheith discloses a method of fixing link time problems relating to out-of-range branch or call instructions, such method comprising: generating near calls at the compiler for all external branches or calls (re rejection in claim 1).

But Gheith does not disclose upon determining that a target is too distant from a call or a branch, generating a trampoline section to the target and redirect the near call to trampoline section. The limitation of calculating the distance from the call to the target address for relocating modification has been disclosed by Kurahashi from claim 4 above, and the limitation to redirect call to get to a remote target address via near call to another call located in trampoline code sections has been addressed by Long from above. The combination to modify Gheith's method to generate near calls for all external calls to include the above teachings by both Kurahashi and Long would have been obvious for the same reasons as set forth in claim 1, and 4 above.

As per claim 6, Gheith discloses glue code (e.g. col. 5, line 63 to col. 6, line 10) and Long discloses trampoline implemented prologue code and epilogue code to bind the caller's end of the memory to the callee's end thereof (e.g. Fig .4). The combination using both teachings to return control to through the trampoline would have been obvious in view of the rationales set forth in claim 1 and claim 4 above.

As per claim 7, Gheith discloses a method of fixing link time problems relating to out-of-range branch or call instructions (re claim 1); but Gheith does not explicitly disclose computing whether a target is too far distant although Gheith mentions determining if a call is external (e.g. Fig. 1,3). Nor Gheith disclose that if the target is too distant, then redirect the new call to a trampoline if such trampoline already exists; or else then generating a trampoline section

to the target for redirecting the near call or branch to the generated trampoline section. These limitations have been addressed using Kurahashi and Long's teachings as mentioned in claims 1 and 4, and thus are rejected herein using the same rationale as set forth correspondingly above.

As per claim 8, the steps of generating sequence of trampoline has been addressed in claim 2 using the rationale to save resources, and of generating a far call via using a near end first trampoline to effect a call to a second remote trampoline, such second trampoline effecting another near-call at the target end to reach the target would also been obvious as addressed in the corresponding rejection as set forth in claim 4 above.

As per claim 9, the steps of returning from the second trampoline as a near return at the target end, a far return from the second trampoline into the first trampoline, and a near return of the first trampoline into the original call would have obvious in view of the rejection as set forth in claim 8 because the return from any calls to any subroutine, whether near or far, implicitly entail the subsequent return in the reverse order with which the calls have been effected.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Pat No 5,857,105 to Ayers et al., disclosing converting indirect calls to direct calls.

U.S. Pat No 5,475,840 to Nelson et al., disclosing dynamic editing of linker commands.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan A Vu whose telephone number is (703)305-7207. The examiner can normally be reached on 8AM-4:30PM/Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (703)305-9662.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9306 (for formal communications intended for entry)

or: (703) 746-8734 (for informal or draft communications, please label
“PROPOSED” or “DRAFT”)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive,
Arlington. VA. , 22202. 4th Floor(Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Kakali Chaki

VAT
September 1, 2003

KAKALI CHAKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100